

Automotive Lightweighting Materials

Carbon Fiber Systems Integration

Background

Because of their high stiffness, high strength, low mass, and low thermal expansion, carbon fiber reinforced polymer composites offer compelling benefits in automotive structures. They can significantly reduce vehicle weight and fuel demand. However, their widespread automotive use has been limited by high materials and processing cost. The selling cost of carbon fiber needs to be reduced to less than half of current prices to become cost-competitive with incumbent materials. Oak Ridge National Laboratory (ORNL) is leading a program to develop low cost carbon fiber technology that includes low cost raw materials and fiber conversion processes. The various developmental materials and conversion modules will be tested, refined, and integrated into a functional system in a modular test facility at ORNL. The test facility will include a subscale conventional modular pilot line that will be mated to advanced technology test modules for testing the

latter. The conventional pilot line was recently acquired and installed at ORNL.

Technology

ORNL is developing methods to rapidly and inexpensively stabilize, oxidize, carbonize, graphitize, and post-treat



Figure 1. Conventional, subscale, pilot carbon fiber conversion line installed at ORNL.

Benefits

- Conversion processes under investigation will reduce time, space, and cost of producing carbon fibers.
- Pilot line will serve as a test bed for advanced technology modules.
- Pilot line will be used to test alternative precursors.



commercial grade carbon fibers made from polyacrylonitrile precursor. Advanced processing methods such as microwaves, plasma, infrared, ultraviolet, electron beam, and combinations thereof are under investigation. Additionally, lower cost precursors from other sources are also in development. The recently acquired pilot conversion line employs conventional thermal pyrolysis technology.

Status

ORNL is working with the Automotive Composites Consortium, as well as heavy truck OEMs and automotive/truck suppliers, to engage both existing and prospective carbon fiber manufacturers. Multiple carbon fiber manufacturers have participated in or contributed to the low cost carbon fiber program, but the industry generally is cautious about technology readiness and the automotive market for carbon fiber. ORNL's carbon fiber systems integration and testing facility is a critical component in scaling the technology and demonstrating its readiness for commercialization. Significant further technology development, maturation, and scale-up is required before the new technology is ready for unsubsidized commercialization.

Contacts

Dr. Felix Paulauskas
Oak Ridge National Laboratory
(865) 576-3785
paulauskasfl@ornl.gov

C. David Warren
ORNL Project Manager
Oak Ridge National Laboratory
(865) 574-9693
warrencd@ornl.gov

Philip Sklad
DOE Field Technical Manager
Oak Ridge National Laboratory
(865) 574-5069
skladps@ornl.gov

Joseph A. Carpenter
DOE Technology Manager
Department of Energy
(202) 586-1022
joseph.carpenter@ee.doe.gov

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.